RADIOISOTOPE BRIEF

Iodine-131 (I-131)

Half-life: 8.06 days

Mode of decay: Beta particles and gamma radiation

Chemical properties: I-131 can change directly from a solid to a gas, skipping the liquid phase, in a process called sublimation. I-131 dissolves easily in water or alcohol and is highly reactive.

Beta particles are subatomic particles that are ejected from the nucleus of unstable atoms. Beta particles can travel through several layers of human skin, and exposure to large sources of beta radiation can cause burns or skin reddening. Beta particles that enter the body can damage cells, which may lead to cell death or, later in life, to cancer.

Gamma radiation is a packet of energy, called a photon, that is emitted from the nucleus of an unstable atom. Gamma radiation is high-energy electromagnetic radiation that can penetrate most substances (lead is the best barrier against gamma radiation). Because of its high energy, gamma radiation can penetrate the human body from the outside and damage cells, which could lead to cancer later in life.

What is it used for?

I-131 is used in medicine to diagnose and treat cancers of the thyroid gland. I-131 also is used in industrial tracers.

Where does it come from?

I-131 is produced commercially for medical and industrial uses through nuclear fission. It also is a byproduct of nuclear fission processes in nuclear reactors and weapons testing.

What form is it in?

In medicine, I-131 is supplied in capsules or liquid of a specific activity designed to be swallowed by patients. As a product of nuclear fission, it is a dark purple gas that can be inhaled, or absorbed through the skin. I-131 in fallout from nuclear weapons or reactor accidents can occur in particle form, which can be ingested in food or water.

What does it look like?

Pure I-131 is a non-metallic, purplish-black crystalline solid. However, because it readily reacts with other chemicals, I-131 usually is found as a compound rather than in its pure form. For medical purposes, the I-131 capsules contain small granules of I-131 sodium iodide that are designed to be swallowed by patients. Liquid I-131 sodium iodide used to diagnose and treat thyroid disease is a clear liquid.

How can it hurt me?

The thyroid gland, a small organ located in the neck near the Adam's apple, uses iodine to produce thyroid hormones. The thyroid gland cannot distinguish between radioactive iodine and stable (nonradioactive) iodine. If I-131 were released into the atmosphere, people could ingest it in food products, milk, or water, or breathe it in. The thyroid gland would then absorb the I-131 and get a dose of radiation from it,

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increasing the risk for thyroid cancer or other thyroid problems. External exposure to large amounts of I-131 can cause burns to the eyes and on the skin.

For more information about I-131, see the Public Health Statement by the Agency for Toxic Substances and Disease Registry at http://www.atsdr.cdc.gov/toxprofiles, or visit the Environmental Protection Agency at http://www.epa.gov/radiation/radionuclides/iodine.htm.

For more information about health effects related to uranium exposure, see CDC's fact sheet on "Radiation and Health Effects," at www.bt.cdc.gov/radiation/healthfacts.asp.

For more information on protecting yourself before or during a radiologic emergency, see CDC's fact sheet titled "Frequently Asked Questions (FAQs) About a Radiation Emergency" at www.bt.cdc.gov/radiation/emergencyfaq.asp, and "Sheltering in Place During a Radiation Emergency," at www.bt.cdc.gov/radiation/shelter.asp.

For information on other radiation emergency topics,
visit www.bt.cdc.gov/radiation, or call the CDC public response hotline
at (888) 246-2675 (English), (888) 246-2857 (Español), or (866) 874-2646 (TTY)

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